

## Dust-gas Interaction and Two-fluid Instabilities in a Protoplanetary Nebula

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We present a two-fluid formalism for the study of the interaction of dust particles and gas in a protoplanetary disk. Using this formalism, we evaluate the stability of the disk's dust layer, in particular with respect to shearing instabilities. We compare the criteria for the onset of shearing instability in the two-fluid formalism to that for the onset of gravitational clumping of the dust disk, and conclude that shear-induced turbulence within the dust layer is likely to inhibit gravitational instabilities. We discuss implications for the growth of planetesimals.

